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PCT/GB2005/000212



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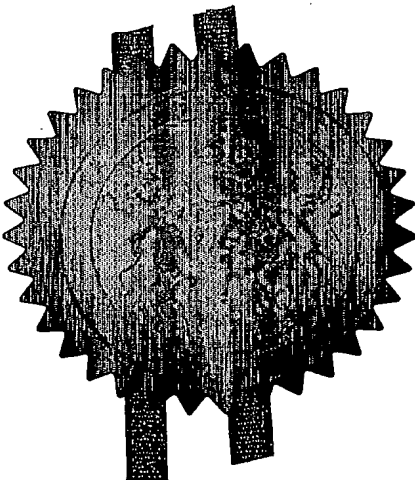
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SC3

2. Patent application number

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3. Full name, address and postcode of the or of each applicant (underline all surnames)

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Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

A COMPACT ELECTRONIC ACTIVITY REMINDER DEVICE

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

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(F517 18.1.05)

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6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

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GB0401575.6

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Patents Form 1/77

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Continuation sheets of this form

Description 11

Claim(s)

Abstract

Drawing(s) 2 1 2 8

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Priority documents

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Statement of inventorship and right to grant of a patent (Patents Form 7/77)

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K. F. Kam

Date

13/9/04

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A Compact Electronic Activity Reminder Device

The invention relates to a portable electronic personal activity reminder device. The particularly important example of the invention usage as an appointment reminder is described in detail.

The inefficiency and cost associated with missing appointments are an important concern to many service providers that allocate scheduled appointments to their clients. Increasingly, some service providers are utilising electronic means such as emails, mobile phone text messages and direct telephone calls to remind the client of imminent appointment. All these methods have some obvious significant cost and implementation disadvantages e.g. not everyone has a PC or mobile phone, nor wish to be contacted by telephone.

Many organisations are already using ISO 7816 type Smart cards for a variety of usage, such as storing records, authentication and e-commerce transactions. The object of this invention is an activity reminder device utilising Smart Card technology. The invention is essentially an integrated circuit (IC) smart card incorporating an acoustic speaker, and/or, a visual alert interface that can also act as an appointment or other activity alert reminder device. The advantages of using the smart card for incorporating an appointment reminder application are its compactness, reusability, easily programmable with time sensitive data and control programs, familiarity and relevance to existing smart card applications, and convenience of building on existing smart card technology and standards, thus reducing the commercial and psychological burden of developing new infrastructure. The invention is therefore compact, relatively inexpensive, and potentially multi-functional and can be adopted and issued to clients by many types of service provider e.g. hospital departments, various healthcare providers such as dentist and GP surgeries, private businesses that regularly allocate appointments or events.

It should be noted that Smart cards incorporating an acoustic interface are already being marketed under trade names such as AudioSmartCard and VocaliD. However, all these cards are designed exclusively for access authentication and/or for secure e-

payment purposes only. These cards are not designed or have the technical facilities to perform as an activity reminder device. The current invention contains significant innovative features in the applications and specifications of a new type of IC smart card, namely an "Activity Reminder Smart Card" (hereafter referred by the acronym AR-SC). The AR-SC comes in two forms: ARA-SC and AREM-SC, which are acronyms for an "Activity Reminder Acoustic Smart Card" and an "ElectroMagnetic warning activity reminder smart card". These inventions are described below.

The generic functionality form of the invention comprises: -

- a) a very thin and compact, portable device with time clock to trigger one or more events (e.g. alarm alerts) according to pre-programmed data and instructions.
- b) means for setting the time clock and the event times from a remote terminal, and if necessary means to alter other data or programs in the invention device.
- c) means for creating an audible sound, vibration or electromagnetic radiation as forms of reminder alert.
- d) means to control functions e.g. to turn off alarm
- e) a compact power source, and
- f) for more advanced version, the ability to display and alter information held in the said device.

A particular form of this invention involves the use of Smart Card technology i.e. an ARA-SC or AREM-SC that comply with the ISO 7816 standards for the physical characteristics and electrical interoperability, as well as the communication protocol between the IC card and the Card Acceptor Device (or more commonly known as a smart card reader). Note there are at least 25 existing and emerging standards that a smart card can adhere to. Most are based on, and/or are subset of the ISO 7816 standards such as the common EMV standard developed by the consortium of Europay International, MasterCard international and Visa International. Depending on the needs of the cardholders and issuers, the current invention, the AR-SC could of course comply with any one of these available standards. The important point here is that the AR-SC should be constructed, as much as possible with common existing or emerging standards such that it allows it to be readily compatible with current or emerging smart card readers. It should be noted that there are also many smart card operating systems (e.g. ISO 7816-4, Java, MultOS, Windows), thus it is assumed that

the AR-SC could be developed under any one of these operating systems, depending on the application and the card issuer's preference.

Detailed description of this invention and several of its embodiments with additional features are given below:

The essential component features of the ARA-SC invention comprise a programmable integrated circuit microprocessor Smart Card with an onboard clock and memory integrated circuit that are linked to a flat speaker (e.g. a piezoelectric audio transducer) that can give out an audio alarm. Depending on the specification of the components used in the invention, the audio alarm could be emitting voice or musical information or just some basic intermittent tone sound to alert the users. In addition to the audio alert, the invention may also, or instead incorporate an electromagnetic wave emission alert, such as a visual alert via the use of LEDs or protruding optical fibres, which shall be refer to as an ElectroMagnetic warning Activity Reminder Smart Card, or AREM-SC for short. As these inventions are an active device, they need to be powered by an ultra-thin flat battery that would fit inside an ISO-standard smart card. Such battery with sufficient capacity and specifications to work within the existing invention is now widely available via a number of high-technology battery producing companies such as Power Paper Ltd in Israel. There is also a function button so the card user can deactivate the alarm when it is on, or press it to activate some other pre-programmed functions. The function button would be designed to prevent accidental activation e.g. a touch/pressure sensitive flat button or some switch that is embedded below the surface of the card. The AR-SCs are issued to the service provider pre-programmed with the appropriate application software that controls the Appointment Reminder Protocol. The service provider (e.g. the doctor's receptionist) would simply issue such a card to the client who has an appointment, incorporating the essential appointment time data and indeed any other useful information (e.g. update clock/date) programmed to the client's card by the usual method of 'swiping' the AR-SC through a Smart card reader (note, it is generally understood that a Smart card reader can read as well as write data to a Smart card). The AR-SC would subsequently activate its appointment reminder alarm at predetermined times prior to the appointment, thus alerting the client of an imminent appointment with the service provider. The Smart card reader may be connected to a PC already used by the

service provider who issues the appointment, or it could be bought as a standalone alone device that has its own keypads, so that appropriate information (e.g. appointment times) can be input into the machine, which could then output that information to the inserted AR-SC. Typically, such smart card reader is fully PC/SC compliant, and in some models also CT-API compliant. A desirable feature, depending on the needs of the issuers is that the smart card reader is also EMV certified.

Alternatively, information data may also be exchanged remotely, if the AR-SC is of contact-less type (e.g. complying with ISO 14443 or ISO 15693 standards). The inputted information such as the appointment time would thus inform the card to activate its appointment reminder alarm or message at predetermined times prior to the appointment in accordance with the appointment reminder protocol program that is stored inside the card. An example of a particularly effective and desirable appointment reminder protocol is given later following the description for Figure 1.

The AR-SC will be readily re-usable as further or new additional appointments can be similarly programmed via a smart card reader or remotely if the card is of the contact-less type. Furthermore, in the future, when major service providers develop their electronic (appointment) booking program, it can be envisaged that the most up to date booking information can be readily accessed and/or updated onto the client's AR-SC via the service provider's e-booking website: the client enters the service provider's e-booking website, confirms their identity online (which could be via the AR-SC which may also contains authentication details, or via the traditional password method) and simply update data in his/her AR-SC through a smart card reader that are linked to the client's own personal computer. Note, many PCs can now be purchased with integrated smart card reader, and it is expected that increasing more new PCs will acquire this facility as standard. The ability to update (download and upload) information online is especially useful as some appointments are rescheduled.

Although, the current ARA-SC has many distinct features compare to the authentication type acoustic smart card, the manufacturing of both types would be similar (see for example patent no. WO0139113 for the fabrication details of an authentication card incorporating a piezoelectric element). Unlike the authentication card, the current invention has the potential to become a mass-market device, due to

its more popular application needs. Thus the cost of individual non-personalised card could become extremely affordable. Furthermore, the cost of the card could be reduced further by having adverts printed on it. Another promotional and application of the current invention is that it can be designed as a business card that has the capability to remind clients of important appointments or events.

Several embodiments and further details of the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1: This shows a plan view of a basic activity reminder acoustic smart card, with its essential features.

FIGURE 2: as Figure 1, plus featuring a visible LED light source at the upper edge of the smart card.

FIGURE 3: as Figure 2, except a strand of optical fibre has replaced the LED.

FIGURE 4: This shows a schematic layout of the electronic components of a basic activity reminder acoustic smart card as described for Figure 1.

As shown in Figure 1, the ARA-SC consists of the following essential features; the main microprocessor unit with an onboard clock and memory integrated circuit 1, an ultra thin flat battery source 2, a flat audio/alarm transducer 3, and a function button 4. Note some of these key features are usually not visible in an actual embodiment of the invention: for example, the key number 1 as pointed by the arrow is actually the contact interface, which facilitates the input and output of information between the card and the smart card reader; the main microprocessor unit, clock and memory integrated circuit are embedded inside the card.

For the purpose of illustration, also shown in Figure 1 are some common features that may be found on the front side of a typical smart card, e.g. the card number, valid dates and names of card issuer and cardholder. For clarity, these features and other optional features such as security holograms, magnetic stripe and signature panel are not illustrated in Figure 1 or the other figures, as they are not essential in the

description of the invention. It is also assumed that the card could be of the contact-less type i.e. information can be read or write to the card without direct contact with a smart card reader. In this type of card, a RF antenna is built inside the card, which is normally hidden from view. It is also understood that the card (front and back) may contain essential text or artwork information which are useful in the use of the invention e.g. service provider names and contact details, instruction on how to use the card, meaning of the sound effects, expiry date of card, adverts or the name of a sponsor etc.

The invention as shown in Figure 1, can be carried by the card holder along with his/her other credit size cards, acting as extra reminder to a paper appointment card, or that it can actually be attached in a non-permanent way (e.g. corners tugged securely behind slits in the paper appointment card or letter, or via a non-permanent adhesive tape on the paper appointment card or letter) with the usual paper appointment card or letter. The advantage of the latter usage is that the AR-SC when it sounds its alarm may also act as an appointment card/letter locator, since research have shown that many paper appointment card/letter are frequently mislaid within the house, thus resulting in more frequent missed appointment. Another useful feature that may be incorporated in the design of the AR-SC is the attachment of a thin strip of weak magnet to the back of the card, so that the card may be readily affix to a metallic surface (e.g. on fridge or metal filing cabinet) in an area where it can be readily heard or seen when the reminding alert is activated.

An important part of the ARA-SC is the application software to instruct the device. One of the greatest advantages of incorporating smart card technology in the invention is the relative ease and flexibility to develop or change the bespoke application programs to suit the demand of individual organisations, and even the demands of individual clients. For example, in using the invention as an appointment reminder device, the application software stored in the ARA-SC may utilise the following desirable Appointment Reminder Protocol, which has been designed with much consideration to the average user, in terms of effectiveness and minimising nuisance factor:

A first reminder alarm will sound at least 2 days before the actual appointment date, followed with a second reminder call alarm on the morning of the appointment date.

The first reminder alarm is to enable the cardholder to offer sufficient warning time to the service provider in the event that the cardholder needs to alter the original appointment time. The first reminder alarm will always start only in the late afternoon, or early evening, so as not to be confused with the second reminder alarm which will start in the early morning on the date of the appointment.

The reminding alarms will be of a low intensity sound (e.g. beeps, chirps etc) repeated at a low intermittent frequency rate for a prolonged period (e.g. up to 30 minutes) or until it is turned off manually by pressing the function button 4. Compared to other alarm calling methods, this low intensity, low frequency and long reminding alarm duration protocol has the following advantages i) low power consumption ii) the long period of the alarm call ensures maximum effectiveness of the user hearing the alarm and iii) the low intensity and frequency of the reminding beeps prevent and minimises an annoyance condition to the card owner and other nearby people should the former not be able to immediately deactivate the alarm (e.g. whilst driving to work).

Additional utilities on the same reminder device can be realised by offering different reminding alarm sounds or via different frequency patterns of the alarm for different types of appointment (e.g. doctor, dental, hairdresser etc.), with printed instructions at the back of the card to inform the card owner of the meaning of the different sounds. Hence, potentially different departments or even totally different organisations can utilise the same card, provided a set of standard protocols are adhered to. To suit the needs of the particular service provider, the exact detail of the appointment reminder protocol described above could of course be readily changed by changing the program or the parameters within it.

Note the above appointment reminder protocol assumes only a basic specification of the device, where the audio alarm is not capable of speech. If the device is capable of giving speech information, then obviously more useful applications and alarm protocol can be written for the device. For example, the time of the next appointment can be revealed verbally when the function button 4 is pressed at any time. Alternatively, pressing function button 4 at any time may activate a particular alarm sequence to indicate if there is any imminent activity (such as an appointment) within a particular set period.

Figure 2 shows another embodiment of the activity reminder smart card which incorporates one or more electromagnetic wave emission source, 5. In this particular example, the source 5 is shown as a Light Emitting Diode (LED). The light will light up or flash when the optional audio alarm is on, or it may function under other situations depending on the programme criteria. The LED(s) may be positioned anywhere on the card, although it is shown here at the edges of the long side of the card for optimal visibility as the card may be carried in a handbag or wallet. The light covers or the actual LED light source may be of different colours to convey additional information or enable more utilities e.g. flashing red light indicates imminent hospital appointment, flashing blue light indicates imminent dentist appointment etc. One advantage of this additional feature is for providing extra awareness of the situation when the alarm is on, or to assist a person with hearing difficulties.

Figure 3 shows another embodiment of the invention that uses a visual alert. Instead of a visible LED light source on the surface of the card, the original light source, which may be a LED, is now embedded inside the card. The light is transmitted to outside the card via a strand of one or more flexible optical fibres, 6. The optical fibre protrudes either vertically, 6 as shown in figure 3 or horizontally out of one the edges of the card. The advantage here is that the light would be more easily spotted in some circumstances when a card may be stored in a limited visibility compartment inside a wallet or handbag.

Figure 4 shows an example of a schematic electrical connection between the main electronic components described in Figure 1, where 1A is the contact interface, 1B is the main microprocessor (the CPU), 1C is the onboard real time clock, and 1D is the onboard integrated memory which for our applications will most likely demand all three of the memory types; ROM, EEPROM and RAM. Note 1B, 1C and 1D are shown as separate components in the figure, although in practice, these components are normally integrated on a single chip. Furthermore, the component 1C could become unnecessary, as the CPU's clock signal may be used to generate real time, if sufficient accuracy can be achieved. The use of non-volatile memory components enables flexible adaptation of new or multiple application programs, as well as minimising power consumption e.g. the Appointment Reminder Protocol application program as

well as the appointment time data could both be held in the EEPROM, whilst the chip operating system is stored in the ROM. As are indicated in the previous figures, the numbers 2, 3, and 4 indicates the battery, acoustic speaker interface and the action button respectively. In the specification shown, there is no digital to analogue component since simple intermittent alarm beeps could be simply activated by applying a voltage on it. If the application requires it, it is also possible to use Pulse Width Modulation technique without requiring expensive sound chip component to reproduce alarm calls that emit voice or musical information. Furthermore, since the activity reminder smart card is an active device (i.e. the smart card has its own power source), then depending on the actual components and design implementation, an isolation circuit may be required for the card to work reliably with a standard Smart card reader that normally only works with a passive (i.e. no battery source in the smart card) smart card.

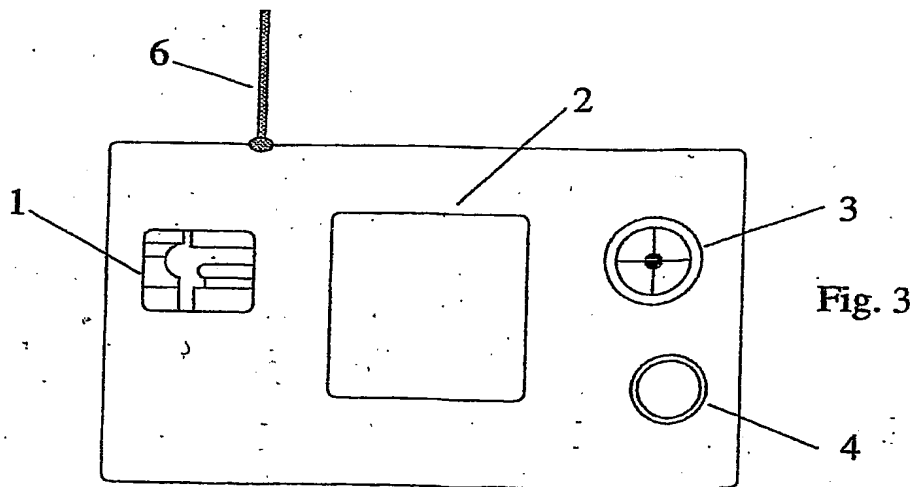
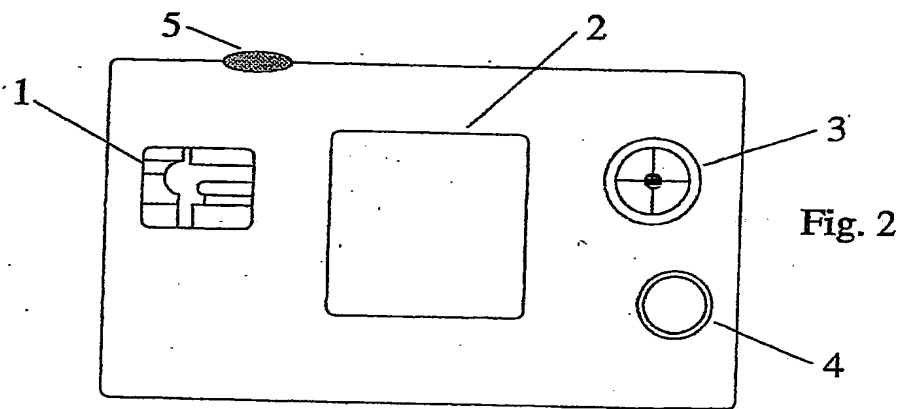
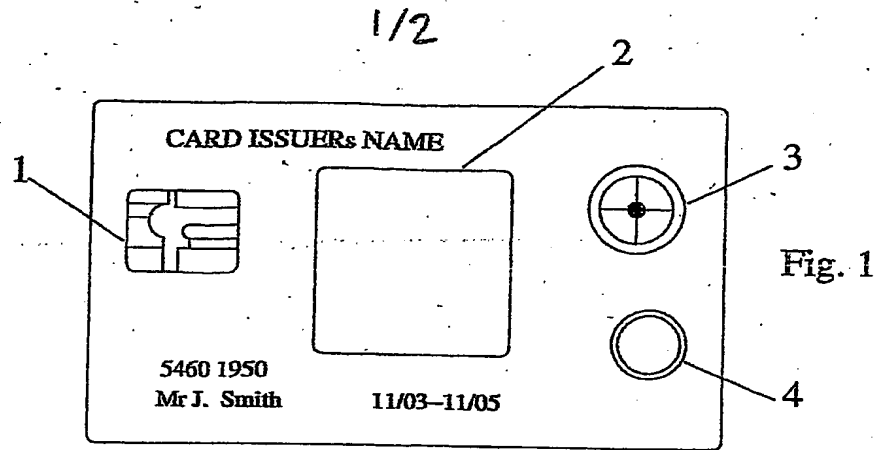
In this paragraph, we describe another embodiment of the invention that take into account increasingly economic production developments whereby the above embodiments can be made more powerful and flexible by including two additional advanced features built into the card. The new features are an electronic display, and one or more keypads to allow altering or updating existing information inside the card. For simple and efficient information updates, a minimum of two keypads can accomplish the task, providing the software is written to allow one keypad to scroll through the list of option, and the other keypad to confirm the current selection or to return to the previous selection. The electronic display can show the relevant information about appointment time, and/or any other relevant information that would be useful to the operation of an activity reminder device. To fabricate an economically viable device with these new features using current mass market production technology, the thickness of the invention may need to increase by two or more times of the ISO dimension standard for smart card. In this case, LCD or organic OLCD is a viable display option. Such card may require a specially designed smart card reader to accommodate the extra thickness of the card, or that it is of the contactless form, so that it is could be programmed only remotely.

Finally, we describe some other novel applications of the AR-SC, which can be realised by simply using a different application program or protocol. These applications include:

- i) Medication reminder for person that needs to take medicine regularly: i.e. a medication reminder protocol is written for the AR-SC such that it activates the alarm whenever the cardholder is required to take their medicine. Particular advantages of using the AR-SC are that changes in treatment regime, which necessitates changes in the medication reminder protocol, can be readily reprogrammed or updated through a smart card reader by the medical practitioner or the cardholder. A possible usage example would be for diabetic patients who need regular insulin injections
- ii) For current smart cards used for access authorisation or e-commerce transactions, modification of such cards to include the additional reminder functions of a AR-SC will allow the following additional useful-functions a) Low credit limit or invalidation reminder: an alarm warning in the AR-SC credit card will activate when the credit limit set by the cardholder or its issuer is reached, or for whatever reason, the card is no longer of valid use. Possible adaptations are bank or credit cards, and public transport payment smart cards. b) Car park time up reminder: Some car parks utilise smart card payment method. If such card incorporates the AR-SC features, then such card could provide a near time-up warning alert.
- iii) ID card worn by personnel could incorporate the AR-SC function, which gives the card an additional function of acting as a security action reminder. For example, a cardholder leaving a secure area may be required to perform some security related actions (e.g. set the alarm, lock the door). Through interaction with a contact-less version of the AR-SC/ID card, detectors near the entrance of the secure area registered when a cardholder is leaving the secure area. When the security related action is performed, a local wireless confirmation signal is sent to the contact-less version of the AR-SC. But if the card holder forgets to perform the security action within a programmed period of leaving the secure area, then due to

the absence of not receiving the confirmation signal, the AR-SC/ID card, will then emit an audio and/or visible alarm to remind the cardholder that he/she has forgotten to perform the necessary security action e.g. lock the door. In addition, the card may also emit a wireless signal to a local receiver in the building to alert the relevant security personnel.

- iv) Many sales letters especially those from insurance related company are now accompanied with information business-like card, to remind the potential customer to ring the company when the customer's insurance (e.g. motorcar or household insurance) is due for renewal. The effectiveness of the sales letter could be drastically improved, if the current information advert card is upgraded to an information advert card with the ARA-SC feature. Thus assuming the company knows the insurance renewal date of the customer, then the reminding alarm in the AR-SC could be set to activate near the insurance due date. This alert would thus remind the potential client to contact the company for a quote. Pressing the control button 4 would deactivate the alarm, or at any other time play a simple musical tune, so as to give the card some novelty value, thus increasing its retention value.
- v) The AR-SC can be used by the detention authority to remind parole prisoners to carry out certain time sensitive duties e.g. to visit the parole officer at certain time.



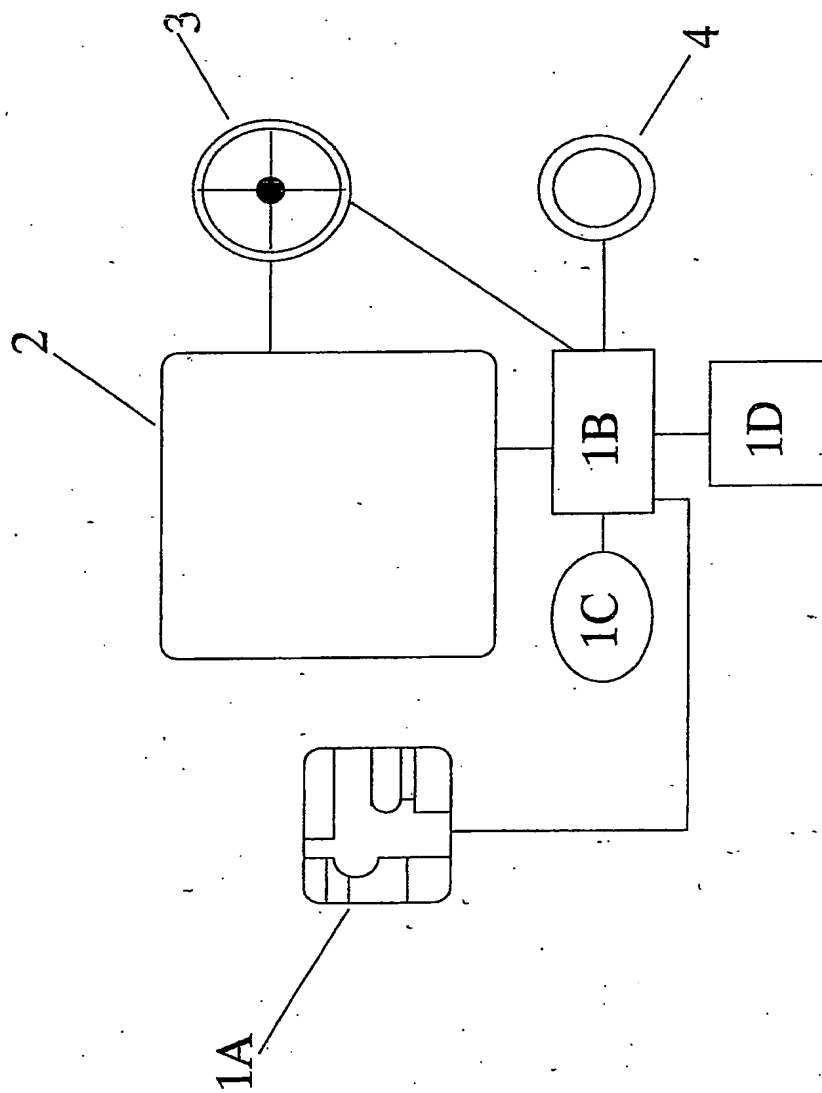


Fig.4